

A CONTRIBUTION TO THE BIOLOGY OF THE HOUBARA (*CHLAMYDOTIS UNdulATA MACQUEENI*); SOME OBSERVATIONS ON 1983-84 WINTERING POPULATION IN BALUCHISTAN¹

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(With three text-figures)

A carefully prepared questionnaire was circulated to persons in different parts of Baluchistan, and the data received from 42 persons were analysed with respect to distribution and population levels, population decline, food and feeding behaviour, roosting, responses to disturbance, trapping and domestication, and migration of the population of the Houbara Bustard (*Chlamydotis undulata macqueeni*) wintering in Baluchistan.

INTRODUCTION

The desolate valleys of Baluchistan (Pakistan) have been recognized as a main wintering resort for the Asian race of Houbara Bustard, *Chlamydotis undulata macqueeni* (Ali and Ripley 1969, Siddiqi 1972). A gradual but rapid decline in all global populations of this bird (Collar 1980) and especially in Punjab (Mirza 1972, Goriup 1980), Sind (Surahio 1981, 1982, 1983), and N.W.F.P. (Roberts and Savage 1972, Malik 1983, Khan 1983), attracted us to this species in Baluchistan. Our researches during the past two years (Mian and Surahio 1983, Mian and Rafique 1984, Mian 1984a, Mian and Dasti 1984) suggested that this region is important in the world conservation map of this species, as it still holds a reasonable population and potential for the presence of a limited breeding activity (Mian 1983, 1985a). As research progressed our interest in the biology of this bustard mounted, with the hope that it would provide a sound base for a well planned conservation strategy.

This report considers a part of data collected on biological and ecological aspects of the population of Houbara wintering in Baluchistan during 1983-84.

MATERIAL AND METHODS

A carefully prepared questionnaire with questions on various aspects of the biology, ecology and declining trends of the Houbara was circulated through the Provincial Forest Department to be filled up by the Forest Guards/Game Watchers based on the observations on the populations of the bird wintering in their respective areas during the 1983-84 winters (facsimile of questionnaire, Appendix I). The questionnaire was also circulated among well known hunters and the local populace. A carefully drafted questionnaire helps in collection of a large body of information, especially when a total survey is not feasible over such an extensive terrain as in Baluchistan with limited financial resources. In all 42 individuals responded, from Zhob, Pishin, Quetta, Chagai, Kharan, Bisemah, Panjgur, Gwadar, Kohlu, Dera Bugti, Sibi and Kachhi. No information, however, was received from Loralai and Lasbella districts.

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The reply to each question was tabulated. Some of the observations were irrelevant and were eliminated from the final analysis after giving due weight to the status of the reporter. Various countercheck questions for the observations helped in selecting the right ones for the final analysis. Information regarding local and visiting hunters, generally seemed to be inadequate, because of the local ban on hunting and official quota allotted to foreign hunters, and hence was not subjected to the analysis of hunting pressure. The data regarding the take of the local and foreign hunters was collected through direct contact with the guides to the visiting falconers in the area, and local hunters.

RESULTS AND DISCUSSION

Distribution and Population Levels:

The Houbara Bustard has a very wide distribution in Baluchistan during the winter months and can be seen everywhere, except for the tops and slopes of the mountains and certain narrow valleys (Table 1, Fig. 1). As the northern part of the province is mainly occupied by Suleiman and Toba Kakar ranges, the favourable bustard tracts are very limited in Zhob (Patao), Pishin (Dolangi and Margakti) and Quetta (Karram) districts. Vast desert steppe valleys occupy most of the southern part, hence the bird exhibits a wider distribution in Chagai, Kharan, Sibi, Kohlu, Kacchi and Makran districts. The presence of various mountain ranges limit bustard population to specific areas in Khuzdar, Punjgur and Bisemah. These findings suggest a much wider spread of wintering population of the species than that anticipated by Roberts and Savage (1972; Makran and Lasbella) and Siddiqi (1972, Maslak, Quetta), and partly confirm the distribution proposed by Mian (1984a), as seen from the hunting successes of the Arab falconers.

The data suggests that though a basal population level of the bird persists in all favourable bustard tracts of Baluchistan, throughout winter (October-March), the peak level is restricted to specific periods, depending upon geographic location and physico-biological factors. Generally in northeastern parts (Zhob, Quetta, Pishin and Nushki) the peak levels are restricted to migratory fluxes, the population of the bird being very low during the rest of the wintering period. Thus, high population is present in Quetta during March-April, and in Zhob, Inam Bostan (Nushki) and Pishin during November-December and February-March. Reasonably high population levels persist throughout wintering period in central and western Chagai, Kharan, Punjgur, Sibi and Kachhi areas, though limited to mid winters (January-March) in southern areas of Gwadar. Such a population fluctuation is understandable, because the northern areas, though lying on the migratory routes (Mian and Surahio 1983), have few valleys with favourable bustard habitat, thus forcing the bird to the southern and eastern areas to pass the major part of the wintering season.

The wintering population of the Houbara exhibits considerable fluctuation in density and dispersion depending on physical conditions present in the specific area. Though the extensive favourable bustard tracts of western Chagai (between Baldandin and Koh-i-Sultan), are famous for bearing a rich population of Houbara throughout winter and as hunting ground for Arab falconers, the present meagre population can be attributed to persistent drought. The information conveyed suggests the presence of good bustard population till January, 1984, and the absence of newly sprouting herbs due to drought has probably forced them to migrate to the southern areas of Urmagai, Washuk and Kharan, which had received scattered rain. The pattern of popu-

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TABLE 1

DISTRIBUTION OF FAVOURABLE HOUBARA BUSTARD TRACTS, POPULATION LEVELS AND DISPERSAL STATUS OF WINTERING AND SUMMERING POPULATIONS IN DIFFERENT REGIONS OF BALUCHISTAN, BASED ON OBSERVATION OF 1983-84 WINTERING POPULATION

Major Areas	Fields with reasonable bustard population	Wintering Population			Summering population level
		Population	Dispersal status	Period of stay	
Zhob	Patao*	Rich	Clumped	November & March-April	Rare, Singles
Pishin	Dolangi Margakti*	Low Moderate	Clumped	Sept. to April	Not seen
Quetta	Karram*	Low Moderate	—	March to April	- do -
Chagai	Inam Bostan Dak Padag Pul Chotao Kambran Game Reserve Gat Game Sanctuary* Nokkundi Koh-i-Sultan Shikar Dal Mashkhel Essa Chah	High Moderate	Clumped	Sept. to April	Very few
Kharan	Everywhere, Urmagai* Jalwar* Jhalawan*	Very Rich	Very clumped	Sept. to April	Few
... Bisemah	Bisemah Mashkey Zaddi	Poor	Dispersed	Nov. to March	Very few till March
... Gwadar	Jiwani Plairi Chittani Chitti Ikharah Dam Pishal Dar Bella Kollunchi Sar-i-Dasht Ball Nagoor*	Poor	Dispersed	Jan. to March	Nil
Kalat ... Khuzdar	Karrah Wamashky Kawartak Mula Kurkh	Poor	Dispersed	Sept. end to April	Very rare

TABLE 1 (contd.)

Kohlu	Sui*	High	Much dispersed	Nov. to March	—
	Pat Feeder	Moderate			
	Tomba*				
	Bohri				
	Subvand				
	Safeed				
	Garsi				
Pazza Berakh					
...Dera Bughti	Dasht Goveran*	Poor	Dispersed	Oct. to March	—
Sibi	Kark	Low	Clumped	Oct. to Feb.	Seldom, probably injured birds
	Kot Parouzi	Moderate			
	Much				
	Lehri				
	Pat				
Wamber					
Kachhi	Saryani*	Low	Dispersed	Sept. to March	
	Bagh Gandana	Moderate			
	All other areas with mustard or				
	<i>Eruch</i> sp.				

* indicate the tract with a relatively higher bustard population.

lation fluctuation stands confirmed through our observations in November, 1983, and from the activities of Arab falconers, who exploited Chagai area in December and Kharan for the rest of the winter. The reports of Kharan receiving a higher bustard population than previous years can be attributed to persistent drought and lack of sufficient vegetation in adjacent areas of Chagai, and to some precipitation during early winter and better vegetative cover in Kharan.

The peak levels of bird population varies in different areas with topography and a number of biological factors, such as vegetative cover, vegetation type and human disturbance. The peak wintering population can be regarded as very high in Kharan (average of 60 birds spotted during a day's walk); high to moderate in Chagai and Kohlu (25); moderate to low in Pishin, Sibi and Kachhi (15); poor in Khuzdar and Gwadar (8); and very poor in Punjgur (2-4). Our findings can be corroborated with hunting successes/activities of Arab

falconers, who claimed a high toll of houbaras in Kharan, whereas no party visited Khuzdar, Gwadar and Punjgur. The exact significance of the various factors contributing to the differential status of wintering populations in a specific area needs to be studied.

The dispersal of wintering population, as indicated by size of groups, varies in different tracts of suitable habitat. Thus our data indicates that the population of the bird is very clumped (15-20 birds per group) in Kharan; clumped (10-15) in Zhob, Pishin, Chagai and Sibi; dispersed (4-8) in Bisemah, Punjgur, Gwadar, Dera Bugti and Kachhi; and very dispersed (1-4) in Kohlu. It appears that population level and dispersal status of bustard are correlated, indicating that both are decided by the environmental factors. Thus optimal vegetation cover and related factors may attract larger population to the area and provide adequate food/shelter so that the incoming groups are not forced to disperse.

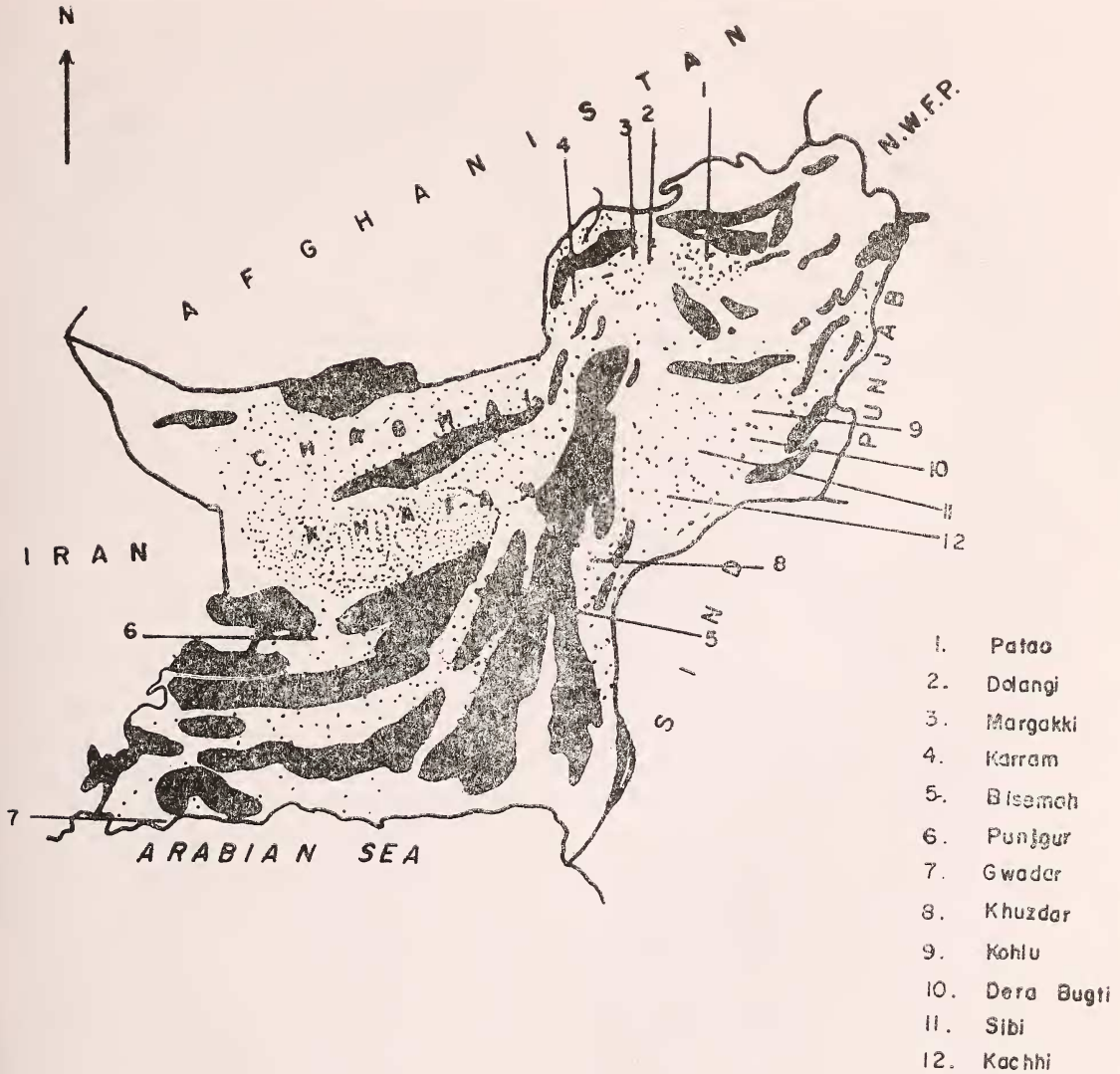


Fig. 1. Line sketch of Baluchistan showing the relative distribution of bustard population. The dots indicate bustard density and filled spaces the approximate location of the mountains.

It appears that the Houbara is attracted to different plant species in different areas. Thus, in Sibi and Kachhi areas its population is concentrated around cultivated fields of *Brassica campestris* (mustard), and *Eruca sativum*

(Jamba), whereas in areas adjacent to Dera Ghazi Khan it is attracted to *Capparis decidua*, partially confirming earlier reports of Surahio (1983) for Houbara, and Ali and Rahmani (1983) for the Great Indian Bus-

tard. Further studies on ecological correlation between population density/dispersal of Houbara and plant type/cover may yield interesting results.

The available information shows that the population of this bustard summering in Baluchistan is very less. Virtually no summering population of Houbara is present in the major part of the province. The very rarely seen birds in areas such as Khuzdar, Sibi, Kacchi and Bisemah are believed to be injured ones, incapable of accompanying the spring emigrants. However, evidence is accumulating that occasionally a few birds do spend the summer in Chagai and Kharan, though these may also show some degree of local migration in accordance with the occurrence of suitable vegetation. These observations agree with similar earlier reports (Ali and Ripley 1969, Roberts and Savage 1972, Siddiqi 1972).

Population Decline:

The information collected through questionnaires and interviews with hunters and tribal chiefs suggests that there has been an obvious decline in the population of this bustard during the last 10-12 years, and the trend is becoming more pronounced with the passage of time. Most of the observers associate this decline with the onset of Arab falconry in the area. These observations are shared by workers throughout the world (Collar 1979, 1980), in Pakistan (Goriup 1981, Surahio 1983, Malik 1983, Khan 1983), and in Baluchistan (Mian and Surahio 1983, Mian 1984a). However, though reports from Soviet Russia (Alekseev 1980, Ponomareva 1979), and from Punjab and Sind (Goriup 1981, Surahio 1982) indicate that the declining trend started some 20 years ago, it became apparent in Baluchistan only in the last 10 years or so. The fact that Arab falconers started exploiting the area quite late may account for this.

Three reports from Khuzdar indicated that the population of the Houbara is not decreasing, but is actually on the increase, though an equal number of reports from the same broad locality maintained that the bird was on the decline, suggesting that the increase reported might be a chance observation; but even if the reports are believed they may not conclusively indicate an actual increase in the overall population. The presence of an apparently higher population in these very limited tracts could be easily attributed to certain specific local factors, including less hunting pressure and/or other biological factors like favourable feeding conditions, which may attract the bird from the surrounding, less favourable areas to these isolated pockets. There have been a number of reports of such local population shift resulting in a higher population density in isolated pockets than in the surrounding areas.

The decline in the abundance of wintering Hobaras has been rapid in almost all the regions for which reports are available and the population of the bird is believed to be much less now than some 10-12 years ago. Rough estimates of the declining rates obtained from casual observers in different parts of the province indicate a declining rate between 5% and 25%, averaging around 10% per annum. Some equivalent decline has been suggested for Sind (Surahio 1982) and Iran (Scott 1975). This rate of decline is higher than what Goriup (1980) has estimated for Cholistan area. The decline rate of 10% per annum is calculated to reduce the population to 39.65% in 10 years and to 32.11% in 12 years. The declining rate in its winter quarters seems to be closely matched by the breeding population in its homeland as the population in Kyzylkum (U.S.S.R.) has been reduced to 25% of the 1965 population level (Ponomareva 1979).

The decline in the population levels of the

Houbara has been generally ascribed to destruction/increased human disturbance of/in its traditional breeding grounds, habitat loss, sheep/goat competition (Ponomareva 1979, Haddane 1983, Mirza 1983), but mainly to hunting pressure (Roberts 1983, Khan 1983). The extent of hunting pressure present in its summering as well as wintering grounds is hard to fully ascertain. There is definitely a considerable hunting pressure on the Houbara population in its summering grounds in U.S.S.R. as well as its wintering grounds in Pakistan and an enforcement of a total ban on local hunting is difficult to execute. However, the present data indicates a clear decrease in activities of local hunters, which may be partially attributed to legislative action and partly to general awareness of the local hunters and prominence given to the species, through efforts of the Forest Staff and our talks with local populace during our field trips in the past three years.

The major hunting pressure on the bustard is, however, attributable to organized falconry. The evidence for a direct correlation between falconry and population decline is hard to collect, but the fact that there is no noticeable decline in population levels of the birds wintering in Khuzdar, where no falconry party has visited, suggests that the decline in the hunted areas is due to the intensive hunting. The only other areas which have not been exploited by falconers include Quetta and Pishin, but both these receive only migratory flocks. The population decline in these areas may be attributed to falconry in other parts of the province. Further, the greater decline reported from Kohlu, Dera Bugti, Sibi and Kachhi than from other regions of Baluchistan may be reasonably attributed to the longer period they have been exploited by falconry parties, whereas Chagai, Kharan, and Punjgur have only recently attracted their attention.

Hunting Pressure:

The extent of hunting pressure from local hunters is difficult to assess because of a ban imposed on hunting of the Houbara by local hunters. The information given to us by the local hunters and prominent people of the different areas suggests that the local hunters did not claim more than 400-500 birds during 1984-85 wintering season in Baluchistan. This seems understandable because the resources available to local hunters are meagre and only a few prominent tribal chiefs can afford car transport. Most of the hunters depend on motor cycles. Further, decreased population density of the bird and its protective coloration makes the hunting very difficult. The number of the Houbara killed by local hunters is on a gradual decrease, partly because of the legal ban on hunting by local hunters and partly because of the general decline in the number of the birds. One of the hunters expressed this fact by saying that whereas previously one could capture some 15-20 birds in a day in the Pishin area, now the occasion is celebrated if a hunter manages to capture even a single bird.

Correct information as to the exact bag size claimed by visiting Arab falconers is also very difficult to collect due to security and secrecy maintained in the hunting camps. The data of hunting successes of falconry parties in different areas (Table 2) suggest that during the 1983-84 winter they claimed 3,961 birds from the area. This hunting toll seems minimum as it mostly pertains to the prominence of the party and does not include the bag of hunters of secondary importance in camp hierarchy, who take their quarry to individual camps. Further, some of the informers were very reluctant to give information, fearing the loss of their source of income. When all these facts are considered, it would not be unreasonable to suggest that approximately 5,000 birds were

TABLE 2

HUNTING SUCCESSES OF THE ARAB FALCONERS IN DIFFERENT AREAS OF THE BALUCHISTAN, DURING 1982-84 WINTERING SEASON

Area	Number of Falconry parties	Number of birds captured*	Total days hunted*
Chagai	1	510	25
Kharan	5	2702	72
Sibi	2	432	—
Dera Bughti	1	62	—
Kohlu	1	25	—
Punjgur	1	85	—
Zhob	1	80	—
Gwadar	1	65	—
Total	13	3961	

* Data regarding the main falconry party only.

taken by the Arab falconers in this region in the 1983-84 winter.

The above figure does not appear to be a gross overestimation of the factual position. This is because of the fact that there is still a reasonable population of the bird concentrated in certain restricted tracts of favourable habitat where there is very limited human disturbance. Other important factors responsible for the mass slaughter of the bird are the modern facilities available with the Arab falconers for swift and far-ranging movement and the competition among the various royal hunters for the largest bag. Further, the hunting is organized through radio communication and hectic efforts of the local guides. Despite all these facilities, an average of 0.7741 birds is claimed per hunting vehicle-day in specially favourable tracts by very well organized parties. These figures are considerably lower in relatively less favourable areas.

Food and Feeding Behaviour:

The majority of data collected agrees with earlier reports that the bird is omnivorous (Ali

& Ripley 1969, Collar 1979, Mian 1983), consuming seeds and young shoots of a variety of plants, and animals, especially slow moving insects and some reptiles. The bird exhibits variation in its food, as per availability of animal/plant material in an area. Houbara consumes *Salsola* sp., *Haloxylon* sp., *Anabasis* sp., *Malcolmia* sp., and *Tribulus* sp. in Zhob, Pishin, Nushki and Kharan, thus confirming our previous findings (Mian & Surahio 1983, Mian 1984a) and results obtained from gizzard content analysis (Mian 1986). In lowland deserts of southern and eastern Baluchistan (Gwadar, Dera Bugti, Sibi, Kachhi), the species depends on the berries of *Zizyphus* sp., seeds of *Brassica campestris*, *Capparis decidua* and *Eruca sativum*, supporting earlier reports from Cholistan (Mirza 1972) and Surahio (1981, 1982, 1983). Our data suggest that the bird consumes a reasonable proportion of animal matter (insects, beetles, mole cricket, ants, grasshoppers), though no lizard/snake was recovered from gizzard contents. This goes against the observations of Mirza (1972) and in favour of those from summering grounds (Alekseev 1980). Further detailed study on gizzard contents collected at different times of the year and from different areas may yield interesting results on energy and water budgeting of the bird.

The diurnal period of maximum activity of the bird coincides with the period of feeding. The main body of information suggests that the bird is mainly active during the day, but the time budgeting seems to be reasonably done in accordance with the surrounding conditions of temperature and light, availability of food and human and grazing disturbances. If conditions allow, the bird is active throughout the day, even at noon and afternoon and even at night. However, the bird generally prefers to be inactive during dark nights and during mid-day. There are indications sug-

gesting that the Houbara in its wintering grounds does move about during moonlit nights, specially when disturbance during the day has prevented normal foraging. Thus, there are persistent reports of the bird feeding mainly during night from Pishin, Quetta, Nushki. This behaviour is presumably due to the general disturbance caused by dense human and live-stock population in all these areas. The nocturnal feeding of the bird in cultivated fields reported from different areas, including the remote parts of Baluchistan may also be partially due to the same cause.

The major activity of the bird seems to be restricted to the cooler morning and evening hours. The feeding activity of the Houbara starts just before sunrise and lasts till approximately 11.00 a.m. The evening session starts from about 4.00 or 5.00 p.m. and lasts till a little after sunset. During the colder months, i.e., January and February, the bird is active and forages throughout the day, which may be necessary due to the shorter day length (from 7.00 a.m. to 5.00 p.m.) and the milder temperature during mid-day. Observations indicate that the bird is more active during the morning foraging session than in the evening. These observations agree with those of van Thanner (1912, 1913), regarding the Canary Island race of the Houbara.

Drinking:

From the experience and casual observations reported by the local populace and from the previous findings of Mian & Surahio (1983) in different areas of Baluchistan it would appear that the Houbara is not an obligatory drinker. All the informations suggest that though the bird is not a regular visitor to water bodies at fixed times of the day as the sandgrouse are, and can pass long periods without drinking, it may on rare occasions take water, if available. Further studies

may indicate some correlation between the type of food consumed and the requirements of water by the bird.

Roosting:

Most of the replies received in response to our questionnaire, from different parts of Baluchistan suggest that the bird has a general tendency to spend the hotter parts of the day, i.e., usually from 11.00 a.m. to about 4.00 or 5.00 p.m., and nights, especially dark nights, at some protective resting place. The hours of roosting are, however, adjusted in accordance with the surrounding conditions and the physiological demands of the bird. The Houbara Bustard, like other bustard species including the Great Indian Bustard (Ali and Rahmani 1983) do not have a permanent nesting or resting place; but during the period of unfavourable environmental conditions or after foraging, the individuals select a roosting place for themselves. This is generally on an open plain, from where the bird can spot an approaching predator at a reasonable distance. The bird has a tendency to select a suitable bush and generally tries to hide its head first, relying fully on its protective camouflaging coloration or the body. It may even select entirely bare areas for roosting.

Many of the reports suggest that the birds do sleep in a protective bush during roosting hours. However, they indicate that the birds remain vigilant throughout the roosting period and it is hard to take them by surprise. The mid-day roosting behaviour has been frequently reported by observers from Canary Islands (Aharoni 1912, van Thanner 1912, 1913).

Response to Disturbance:

The behavioural response to a specific stimulus at a given time seems almost unpredictable. It varies with the type of stimulus,

biotic and abiotic factors in the areas and psychological state of the bird, though the following generalizations can be drawn.

The bird tends to stay at a distance of 5-8 km from large human settlements. This distance generally decreases in direct proportion to the decreasing size of the settlement, and small nomadic camps have no effect on dispersion of the bird. Some strays have been reported to come in the vicinity of human settlements, especially during the night hours, when human activity subsides. On a number of occasions this was noted by us, both through direct watching and from the presence of footprints, especially around cultivated tracts. The distance maintained by the Houbara from human settlement may be decided by disturbance level. Thus, recent disturbance in desolate deserts through hectic falconry has probably forced the bird to find refuge in the vicinity of Kharan town. Similarly extensive cultivated tracts in Pishin, Nushki, Khuzdar, Sibi and Kachhi may force the bird to stay in cultivated fields and hence within a radius of 1-2 km of human settlements. Conversely, vast favourable desolate areas and relatively low bird population may allow the bird in Zhob, Panjgur and Kohlu to remain at some 16-20 km from human settlements. Though there is no definite study, the present report agrees with the general belief that Houbara avoids large human settlements and small nomadic camps have no bearing on its distribution (Ali and Ripley 1969, Roberts and Savage 1972, Surahio 1981, 1982, Mian and Surahio 1983, Mian 1984a).

The Houbara Bustard being very shy, keeps away from busy roads. It is least disturbed by grazing camels and may even be attracted towards them. Presently available data support our previous observations that the bustard is not scared by the slow and gradual approach

of a haphazardly tainted structure (Mian and Surahio 1983). Grazing sheep/goat do cause some concern to foraging birds and they keep away from cattle. The birds are watchful and use their obliterative camouflage to hide. They are little disturbed by a slow moving and indirectly approaching automobile, but, fast moving, noisy vehicles alarm the birds and cause them to fly away. The bird will hide or fly away from even a slow moving vehicle, if it has been recently chased.

The Houbara tolerate the least a man moving on foot, walking away immediately and maintaining definite distance. It may keep walking ahead of a man, especially in a dried water course, hide in a bush, squat on the ground or may even fly off, if approached closely or if it had been disturbed previously. A man moving along with grazing sheep/goat/camel causes less alarm to the Houbara and this is exploited by local hunters. The average flight distance of the houbara in Baluchistan is about 300 m. However, this distance varies considerably with the population level of the bird, general disturbance and extent of falconry in the area. Thus, in Kharan with limited hunting activity and higher population levels of bustards some 10-12 years ago, the Houbara frequently allowed human approach to within 20-40 m. With the onset of massive hunting and decreased bustard population in the area, a man can hardly approach the bird to a distance of 100 m. In the presence of a specific blend of interacting factors to Houbara now allows human approach to 100-200 m in Zhob, Kohlu, Sibi, and Quetta; to 200-300 m in Pishin, Nushki, Bisemah, Gwadar, Kachhi and Khuzdar; and to 600-1000 m in Punjgur.

The data suggests that the bustard has variable reaction to the same stimulus, depending on its previous experience. The bird, generally, walks briskly or runs away when alarmed, with outstretched and lowered neck

and watchful eyes, taking full advantage of the camouflaging effect of its plumage, deceptively high speed and shrub cover. However, if continuously alarmed the bird flies away, settling at a distance of about 200-800 m where it immediately runs to cover.

The Bustard reacts in particular manner on sighting a falcon. On seeing a flying falcon, the Houbara immediately squats, relying on its protective camouflaging colour. Among shrubs it prefers to protect its neck, rather than the body, probably to avoid a direct stoop on the head. On flat ground the neck is kept flat on the ground, with the hind part of body slightly raised. The Houbara remains remarkably still, as long as the falcon remains in the vicinity, on rare occasions, local people catch such a bird, and one of the hunters from Kharan claimed to have caught four birds with bare hands from one spot. Such behavioural response might save the bird from a possible disastrous reduction in number through falconry. When a bustard is being chased by a falcon, all other bustards in the area squat motionless and hidden, thus escaping the eyes of the battery of radio coordinated falconers present in 3-5 hunting vehicles, capable of releasing 10-20 falcons if the bustards are spotted. Our data agree with previous reports that the Houbara squirts a gummy anal fluid when pursued by a falcon (Ali and Ripley 1969). A report from Kachhi stated that a Houbara lying on the ground, when detected by an approaching falcon, squirts gummy anal liquid, by raising its hind part with a jerk, causing temporary blindness to the falcon! A flying houbara, on seeing the chasing falcon, immediately tries to fly upward to avoid a possible stoop from the falcon, but bustards seldom succeed in escaping.

Migration:

The information received from different

areas and workers, when analysed allows us to propose migratory routes (Fig. 2), which generally agree with those suggested earlier (Mian and Surahio 1983). The observations so far made, persistently suggest a general north-south autumn migration through very diffused routes, extending from northern Zhob to western Chagai (Azar Chah). This is consistent with earlier reports (Mian and Surahio 1983, Mian 1984a, Goriup 1980) but do not agree with Roberts and Savage (1972), suggesting well defined routes, occurring around the plains of Muslimbagh; and Anonymous (1972) and Karim and Hassan (1983), presuming Iranian origin for the population of Houbaras wintering in Baluchistan. During the return migration in spring the bird follows almost the same routes, though more directly. Our present data partly supports previous hypothesis (Surahio 1981, 1982, 1983) that the population of Houbara wintering in Sind pass through central Baluchistan (via Sibi and Kachhi), though no convincing evidence is available suggesting that the wintering population of Dera Ismail Khan (N.W.F.P.) passes through northern Baluchistan, i.e., Zhob (Malik 1983).

The replies to our enquiry persistently suggest a general north-south or south-north orientation of the autumn/spring migrating flocks, though it varies slightly as per the location of favourable bustard habitats, and orientation of mountains and very narrow valleys; the bird generally avoids passage over high mountains and narrow valleys (Mian and Surahio 1983). Thus, the Raskoh Range, forces the entry of the bird into Kharan valley from the southwestern direction; while Siahan and Central Makran ranges allow its entry into Punjgur from southwestern, and into Gwadar from almost a western direction. Relatively extensive interconnected valleys around Much allow the passage of the bird

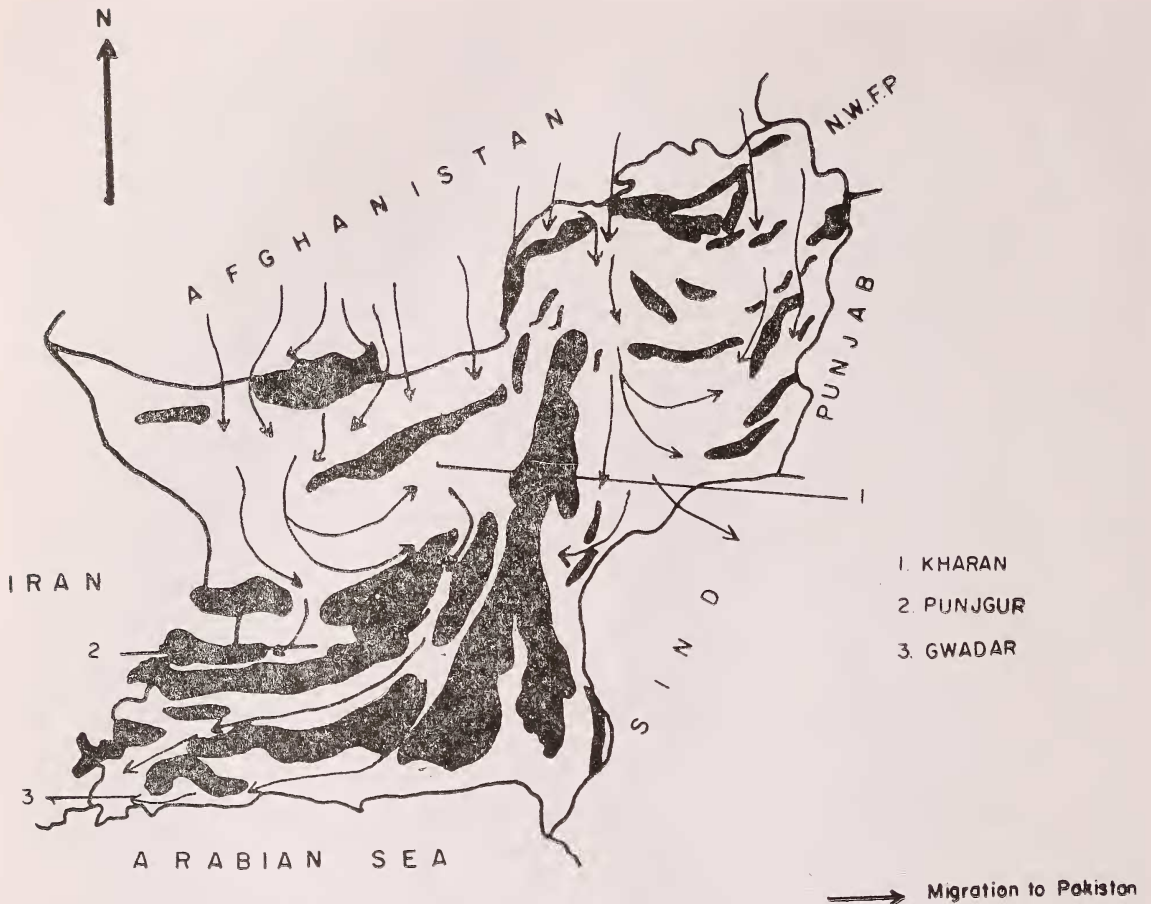


Fig. 2. Line sketch of Baluchistan showing the tentative migration routes of the Houbara Bustard.

through the Central Brahuui Range, thence reaching Sibi from a northwestern direction. Some reports indicate that the bird population wintering in Khuzdar, enter the area through the west, probably from the adjacent areas of Kachhi.

The information regarding the first sighting of the Houbara in different areas seems sketchy, casual observers being unable to record exact dates. However, data regarding tentative dates of the arrival of first migrants in different areas suggest that the autumn migration is a rather slow process and birds

continue moving gradually towards southern latitudes. The birds arrive in September in northern parts (Chagai, Pishin; some sporadic birds recorded in mid August), towards the end of September or early October in central parts (Kharan, Sibi, Kachhi, Khuzdar), during mid- or end of November in southern parts (Bisemah, Punjgur), and the birds are not frequent till January in extreme southern parts (Gwadar; sporadic birds recorded in November). This indicate that the birds generally arrive earlier in northern latitudes and later in southern latitudes. These observations largely

agree with the previously available reports, suggesting that Houbara starts migrating from U.S.S.R. in early September (Ponomavera 1979) or even the first half of August (Mesarier 1904) reaching northern Baluchistan in late September or early October (Mian and Surahio 1983, Mian 1984) and continue moving deeper into the province after consuming available food in the area (Mian and Surahio, loc cit.) reaching Punjab and Sind in October (Roberts and Savage 1972, Mirza 1983, Surahio 1983).

The precise dates of onset of spring migration are hard to record. It appears to start in March in all the parts and is complete by early April, suggesting that it is more abrupt than the autumn migration. These migrants reach summering grounds in U.S.S.R. towards the end of March or by mid-April (Alekseev 1980).

The present data confirm our earlier hypothesis (Mian 1984) suggesting a larger size for the autumn migrating flock in northern areas and dispersal of the birds causing a smaller flock size in the southern areas. The size of immigrating flocks seems to be directly proportionate to the distance travelled to the wintering grounds (Fig. 3), so that flocks of 15-25 observed in northern parts (Zhob) decreases to 10-15 in Pishin, Chagai, Kohlu and Kharan; 8-10 in Sibi and Kachhi; 4-8 in Bisemah and Khuzdar and 4-6 in Gwadar. The data collected by Alekseev (1980) suggest that, at the onset of autumn migration 63% of the birds are in ones and 24% in twos, while leaving the summering grounds. The correlation of our results with those of Alekseev (loc. cit) suggests that the larger flocks are formed during migration, and secondary dispersal occurs in the wintering grounds, probably due to intraspecific competition. The exact significance of this migratory behaviour is hard to explain and need further studies.

The information conveyed regarding the size of spring migrating flock suggests that it is smaller than of the autumn migrants. Generally it ranges between two and eight. This observation is in sharp contrast to our previous report suggesting that the size of the spring migrating flock is larger (Mian and Surahio 1983). Though further data would reveal the exact situation, our present data provide a better explanation, as the spring migration is rather direct and reports from summering grounds indicate that birds reach in ones (50%), twos (20%) and 3-8 (30%), (Alekseev 1980).

Trapping and Domestication:

The data indicate that very limited trapping is being practised in Baluchistan. During recent years, decreasing population of Houbara has rendered this hobby as time consuming, tiresome and with little chance of success. Distribution of firearms and automobiles has, on one hand, increased the hunting pressure, while on the other hand decrease in trapping success is due to the associated disturbance. Trapping is reported to be possible but difficult, the birds being very clever, cautious and extra-vigilant. Apart from triangular enclosure of local bushes with net used in Chagai and Kharan (Mian and Surahio 1983) and net laid on ground as in Kachhi, Sibi, Kohlu, Dera Bugti and Pishin (Mian 1984a) the affinity of the bird for *Capparis decidua* is exploited in northeastern flank of Baluchistan and adjacent areas. An isolated dense bush of the plant is selected and netted all around except at the side where it is curved into a V-shaped entry point. The bird is attracted towards this plant from long distances and by habit enters the bush through the open end and is finally trapped. This technique is quite effective, requiring less physical labour.

There is no information that the Houbara is kept as a domesticated bird. It is generally

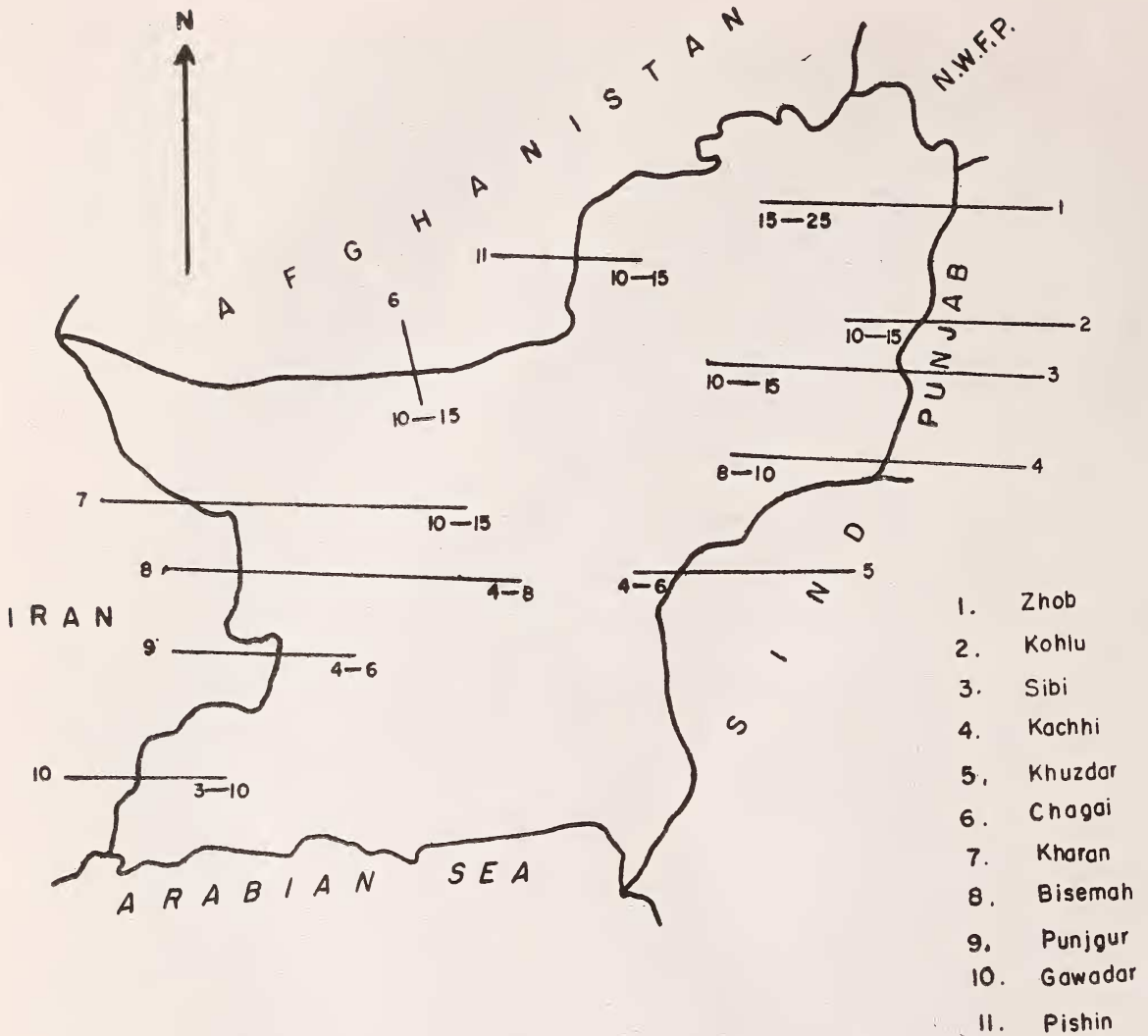


Fig. 3. Line sketch of Baluchistan showing the size of autumn migrating flock in different areas of the Province. The figures in the map represent the number of the birds in the flock.

believed that the bird cannot be kept as a pet, and it has been kept in captivity for only 10 days. The trapped birds are either eaten by the trapper or presented to an influential person as a delicacy.

Flock Formation:

Though the Houbara is gregarious in its

wintering ground, forming flocks of various sizes in different areas, individual birds maintain a reasonable distance from one another. The flock size varies from 5 to 40 in different areas and is decided by population level of the bird and suitability of habitat. Rarely, flocks of larger size are also observed. Luckily, we saw a rare flock of 500-800 birds flying

over the area around Yakmuch (Gala Chah). This flock started appearing as a few birds in flight and the size of the flock gradually increased. The flock was observed for some time, when the hovering birds made fascinating pattern of brown and white. The cause for the formation of such a large flock could not be ascertained except that some hunters with powerful motor cycles were believed to be present in the area. Our discussions in Kharan suggested that such large flocks can sometimes be seen in favourable bustard tracts in

the deeper western parts, though the appearance of such large flocks is gradually becoming a very rare phenomenon.

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ANNEXURE I: Facsimile of the questionnaire. (English translation of the original circulated in Urdu).

HOUBARA RESEARCH LABORATORY
ZOOLOGY DEPARTMENT
UNIVERSITY OF BALUCHISTAN
QUETTA

Note: Houbara is called in Pushto 'Sar', 'Zar'; in Baluchi 'Charaz' and in Urdu, Punjabi and Sindhi 'Taloor'.

Your name

Locality (Full address)

1. When did you see the first Houbara this year? Please mention date and month.
2. What was the size of the incoming group?
3. What is the part of the day exploited by the incoming bird? Day/night; moonlit night/dark night.

4. What is the direction of the incoming group?
5. Does this bird remain in your area throughout the wintering period? If not, at what part of the year can the bird be seen in your area, and in which direction it leaves the area?
6. What is the major type of terrain in your area: hilly/plain; sandy/stony; hard/loose?
7. What are the dominant plants of your area? (Please mention local names).
8. Is the major part of the land in your area barren or arable?
9. What are the bustard tracts in your area (mention names)?

BIOLOGY OF THE HOUBARA (CHLAMYDOTIS UNDULATA MACQUEENI)

10. What does this bird eat?
11. What part of the day is exploited by the bird for its feeding activity?
12. What is the part of the day when maximum number of birds can be seen?
13. What is the maximum number of the birds you have seen in a day. (specify area in which seen)?
14. What is the usual size of the flock in different bustard tracts?
15. What is your approximation regarding the number of the birds visiting your area during this wintering season? Were they more or less than the previous years?
16. Have you ever cared to examine the type of food present in the gizzard? If yes, what were the major food items?
17. Does this bird sleep? If yes, where?
18. Have you ever seen the bird drinking water?
19. Can the bird be live-trapped: If yes, what technique is exploited?
20. Have you ever kept the bird as a pet? If yes, how?
21. What is the total number of the birds captured by the local hunters? If possible, please indicate the number of the males and females separately.
22. What was the number of parties of foreign hunters that visited your area? Please indicate the number of hunting vehicles, falcons, number of the Houbara hunted, any other wild animal hunted. If possible, please indicate the number of males and females separately.
23. In your opinion, is there a declining trend in the population of this bird in the last ten years?
24. What is the approximate distance from which a bird flies away on seeing a man?
25. What is the approximate distance which is being maintained by the bird from human settlement?
26. What is the reaction of the bird to grazing livestock or jeep etc.?
27. Does the Houbara lay eggs in your area? If yes, where (Name the area), when (Name the month or season)? What was the number of eggs in the nest you spotted? Were the nests in bushes or on the ground? What was the shape and size of the egg? Mention colour also.
28. In your opinion what is the total number of females that lay eggs in your area?
29. What is the approximate time of year used by the Houbara for returning from your area during spring.
30. Have you ever seen the bird during summer months?
31. What is the size of the flock of the spring migrants?
32. What is the part of the day exploited by the bird for spring migration?
33. What is the approximate size and colour of this bird in your area?
34. What are the major animals of your area?
35. Any other information.

Thank you for your co-operation.